MAY 2 1 1988

FLOOD INSURANCE STUDY

UNION COUNTY, FLORIDA

UNINCORPORATED AREAS

AUGUST 4, 1988

Federal Emergency Management Agency

COMMUNITY NUMBER 120422

ORIGINAL

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FLOOD INSURANCE STUDY

UNION COUNTY,
UNINCORPORATED AREAS,
FLORIDA

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Unincorporated Areas of Union County, Florida, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by the U.S. Army Corps of Engineers (COE), Jacksonville District (the Study Contractor) for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. EMW-83-E-1822, Project Order No. 1, Amendment No. 13a. This study was completed in December 1986.

1.3 Coordination

An initial consultation and coordination meeting to explain the nature and purpose of a Flood Insurance Study and to determine the areas to be studied in Union County was held in Jacksonville, Florida, on January 29, 1985. Representatives of FEMA, the COE, and the Suwannee River Water Management District (SRWMD) were in attendance. A meeting with the SRWMD to discuss the preliminary findings of this study was held in Jacksonville, Florida, on June 11, 1986.

On September 16, 1987, the results of this Flood Insurance Study were reviewed and accepted at a final coordination meeting attended by representatives of the Study Contractor, FEMA, and the community.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the unincorporated areas of Union County, Florida. The area of study is shown on the Vicinity Map (Figure 1). The incorporated areas within the county were excluded from this study.

Flooding caused by overflow of the Santa Fe River was studied in detail.

Approximate analyses were used to study those areas having a low development potential or minimal flood hazards.

The areas studied were selected with priority given to all known flood hazard areas and areas of projected development or proposed construction through December 1991. The scope and methods of study were proposed to and agreed upon by FEMA and Union County.

2.2 Community Description

Union County is situated in northeastern Florida. It is approximately 35 miles southwest of Jacksonville, Florida, and approximately 25 miles north of the City of Gainesville, Florida. The county is bordered by the unincorporated areas of Baker County, Florida, on the north; Bradford County, Florida, on the east; Alachua County, Florida, on the south; and Columbia County, Florida, on the west. Union County is served by State Roads 121, 100, 238, and 121. The Norfolk Southern Railway and the CSX railway traverse the county. The 1980 population of Union County was reported to be 10,166, an increase of 26 percent above the 1970 population of 8,112 (Reference 1).

Union County is the smallest county in Florida. Over 80 percent of the 241 square miles of land is devoted to commercial forests, although agriculture is active in truck farming and raising hogs and cattle.

The county is in the Gulf Coastal Lowlands physiographic area with topography ranging from 50 feet to about 140 feet above the National Geodetic Vertical Datum of 1929 (NGVD). The major fresh-water swamp association of soils adjacent to the Santa Fe River consists of nearly level, very poorly drained soils subject to prolonged flooding (Reference 2).

The climate of Union County is semi-tropical. Characterized by long, hot summers and mild winters, the average annual rainfall is 49.40 inches, while the average temperatures vary from 55.9 degrees Fahrenheit (°F) in January to 81.4 °F in August.

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

UNION COUNTY, FL
(UNINCORPORATED AREAS)

APPROXIMATE SCALE

0 7 14 21 MILES

VICINITY MAP

2.3 Principal Flood Problems

The most severe floods in the Santa Fe basin are associated with storms or sequences of storms that produce widespread distribution of rainfall for several days duration. Flooding occurs in all seasons, but maximum annual stages occur most frequently from February through April as a result of a series of frontal-type rainfall events over the basin. The area is also subject to summer and fall tropical disturbances, occasionally of hurricane intensity. Thunderstorms caused by summer air mass activity produce intense rainfall, but the duration is usually short and aerial distribution is relatively small.

The September 1964 flood was the largest flood on the Santa Fe River. The discharge for the 1964 flood at the gage near the Town of Ft. White was 17,000 cubic feet per second (cfs); at the Town of Worthington Springs the discharge was 20,000 cfs.

The table below lists historical floods at two gage locations on the Santa Fe River. The Ft. White gage is downstream from Union County.

HISTORICAL FLOODS

LOCATION	PEAK DISCHARGES (cfs)				
Santa Fe River	1964	1948	1934	1945	1947
near Fort White	17,000	12,300	11,400	9,300	8,110
at Worthington Springs	20,000	14,900	15,700	15,700	14,900

2.4 Flood Protection Measures

Flood protection measures are not known to exist within the study area.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (1-percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to

approximately 60 percent or in 10. The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each riverine flooding source studied in detail affecting the community.

The U.S. Geological Survey (USGS) has been monitoring flows in the Suwannee River basin since the flood of 1928. Each year, the USGS publishes the water resources data collected and periodically reports on the magnitude and frequency of floods. The hydrologic data analyses for this study utilized these publications and the results were coordinated with the USGS.

Analyses of discharge records of all gaged locations on the Santa Fe River were used to establish peak discharge frequency relationships throughout the river reaches. Flood recurrence frequencies were determined by log-Pearson Type III statistical analysis in accordance with procedures recommended by the USGS (Reference 3). On the Santa Fe River, a rainfall runoff model was developed using the standard Soil Conservation Service procedure and the HEC-1 runoff model (References 4 and 5). The model was calibrated to the Hurricane Dora flood of 1964 and verified by statistical analysis of discharge records from four long-term gages on the Santa Fe River.

Peak discharge-drainage area relationships for the 10-, 50-, 100-, and 500-year floods of each flooding source studied in detail in the community are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ MILES)	PEAK DISCHARGE (CFS) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
SANTA FE RIVER					
near the Town of Ft. White	1,017	9,192	13,791	16,717	22,200
at the Town of Worthington Springs	630	12,824	20,748	25,162	36,300

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Cross-section data were obtained from photography by aerial survey methods flown for the floodplain areas and by field measurements for the main channel and immediate overbanks (Reference 6). All bridges were field

surveyed to obtain elevation data [illegible].

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles. For stream segments for which a floodway was computed (Section 4.2), selected cross-section locations are also shown on the Flood Insurance Rate Map.

Water-surface elevations of floods of the selected recurrence intervals were computed using the HEC-2 step-backwater computer program (Reference 7). Roughness coefficients ("Manning's "n") used in the hydraulic computations were determined by analyzing known flood events in the Union County reaches of the Santa Fe River. The Manning's "n" values used for the Santa Fe River calculations were 0.059 for the main channel and 0.310 for the overbank areas. The starting water-surface elevations were obtained from the Flood Insurance Study for Alachua County, Florida (Reference 8).

Flood profiles were drawn showing the computed water-surface elevations for floods of the selected recurrence intervals. In cases where the 50- and 100-year flood elevations are close together, due to limitations of the profile scale, only the 100-year profile has been shown.

The hydraulic analyses for this study are based on the effects of unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the NGVD. Elevation reference marks used in this study are shown on the map and described in the exhibit labeled Elevation Reference Marks.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year floodplain boundaries and 100-year floodway to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the 100- and 500-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:2400 with a contour interval of 5 feet (Reference 9).

The 100- and 500-year floodplain boundaries are shown on the Flood Insurance Rate Map. On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A, AE, AH, AO, A99, V, and VE) and the 500-year floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 100- and 500-year floodplain boundaries are close together, only the 100-year floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 100-year floodplain boundary was delineated using the Flood Hazard Boundary Map for Union County, Florida (Reference 10).

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces the flood-carrying capacity, increases the flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced.

The floodways presented in this study were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections and are shown in Table 2, Floodway Data. The computed floodways are shown on the Flood Insurance Rate Map. In cases where the floodway and the 100-year floodplain boundaries are either close together or collinear, only the floodway boundary is shown. Portions of the floodway for the Santa Fe River lie outside the county boundary.

The area between the floodway and the 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
SANTA FE RIVER								
A	40.91	1497	24,272	1.0	58.5	58.5	59.4	0.9
B	41.56	3997	50,186	0.5	59.6	59.6	60.6	1.0
C	42.54	4161	53,577	0.4	60.8	60.8	61.8	1.0
D	44.02	1746	23,693	1.0	63.0	63.0	63.9	0.9
E	45.48	1600	26,451	1.0	66.2	66.2	67.1	0.9
F	46.59	1779	22,357	1.1	68.0	68.0	68.9	0.9
G	48.04	1435	25,510	1.0	70.9	70.9	71.8	0.9
H	49.19	1749	30,074	0.8	72.5	72.5	73.4	0.9
I	49.38	1792	29,035	0.9	72.9	72.9	73.9	1.0
J	49.61	1537	19,936	1.3	73.6	73.6	74.6	1.0

[1]MILES ABOVE MOUTH
[2]THIS WIDTH EXTENDS BEYOND COUNTY BOUNDARY

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

UNION COUNTY, FL
(UNINCORPORATED AREAS)

FLOODWAY DATA

SANTA FE RIVER

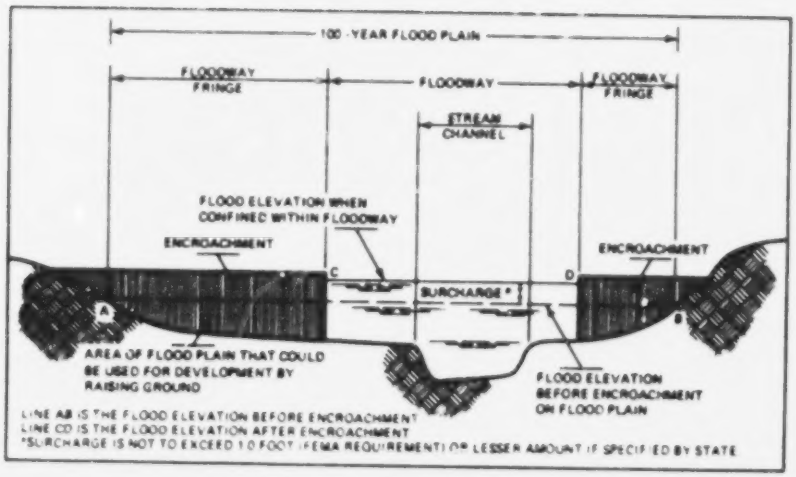

100 - YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE *
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE

FIGURE 2 - Floodway Schematic

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 100-year floodplain, areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols the 100- and 500-year floodplains, the floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

7.0 OTHER STUDIES

A Special Flood Hazard Information Report (SFHIR) was prepared by the COE (Reference 11) and is now superseded by this study.

Flood Insurance Studies are in progress for Alachua, Bradford, and Columbia Counties, Florida, and the Town of Worthington Springs, Florida (References 8 and 12-14) and are in agreement with this study. A Flood Insurance Rate Map has been printed for the Town of Lake Butler, Florida (Reference 15) and is also in agreement with this study.

Preparation of a Survey Review for the Suwanee River Basin, Florida, has begun (Reference 16). However, work has not progressed sufficiently to date to permit a comparison with the determiantions contained in this report.

Due to its more detailed analysis, this Flood Insurance Study supersedes the previously printed Flood Hazard Boundary Map for Union County (Reference 10).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, FEMA, 1371 Peachtree Street, NE., Suite 736, Atlanta, Georgia 30309.

9.0 REFERENCES AND BIBLIOGRAPHY

1. U.S. Department of Commerce, Bureau of the Census, 1980 Census of Population, Number of Inhabitants, Florida, Washington, D.C., February 1982.

2. Florida Bureau of Comprehensive Planning, The Florida General Soils, Atlas, July 1975.

3. U.S. Department of the Interior, Geological Survey, Interagency Advisory Committee on Water Data, Office of Water Data Coordination, Hydrology Subcommittee, Bulletin No. 17B, Guidelines for Determining Flood Flow Frequency, September 1981, revised March 1982.

4. U.S. Department of Agriculture, Soil Conservation Service, Engineering Division, Technical Release No. 20, Computer Program for Project Formulation, Hydrology, May 1965.

5. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-1 Flood Hydrograph Package, Computer Program 823-X6-L2610, Davis, California, January 1973.

6. ————, Jacksonville District, Stream Cross Sections, Southern Resource Mapping, Ormond Beach, Florida, compiled by photogrammetric methods from aerial photography, October 1985.

7. ————,Hydrologic Engineering Center, Generalized Computer Program HEC-2, Water-Surface Profiles, Davis, California, November 1976.

8. Federal Emergency Management Agency, Flood Insurance Study, Alachua County, Unincorporated Areas, Florida, September 1984, revision in progress.

9. U.S. Geological Survey, 7.5 Minute Series Topographic Maps, Scale 1:24000, Contour Interval 5 feet: Ellaville, Florida, 1963; Lulu, Florida, 1966; Lake Butler, Florida, 1966; Raiford, Florida, 1970; Mikesville, Florida, 1962; Worthington Springs, Florida, 1966; Brooker, Florida, 1966.

10. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Union County, Unincorporated Areas, Florida, December 1977.

11. U.S. Army Corps of Engineers, Jacksonville District, Special Flood Hazard Information, Suwanne River Floods, Florida and Georgia, December 1974, revised February 1983.

12. Federal Emergency Management Agency, Flood Insurance Study, Bradford County, Unincorporated Areas, Florida, in progress.

13. ————, Flood Insurance Study, Columbia County, Unincorporated Areas, Florida, January 1988.

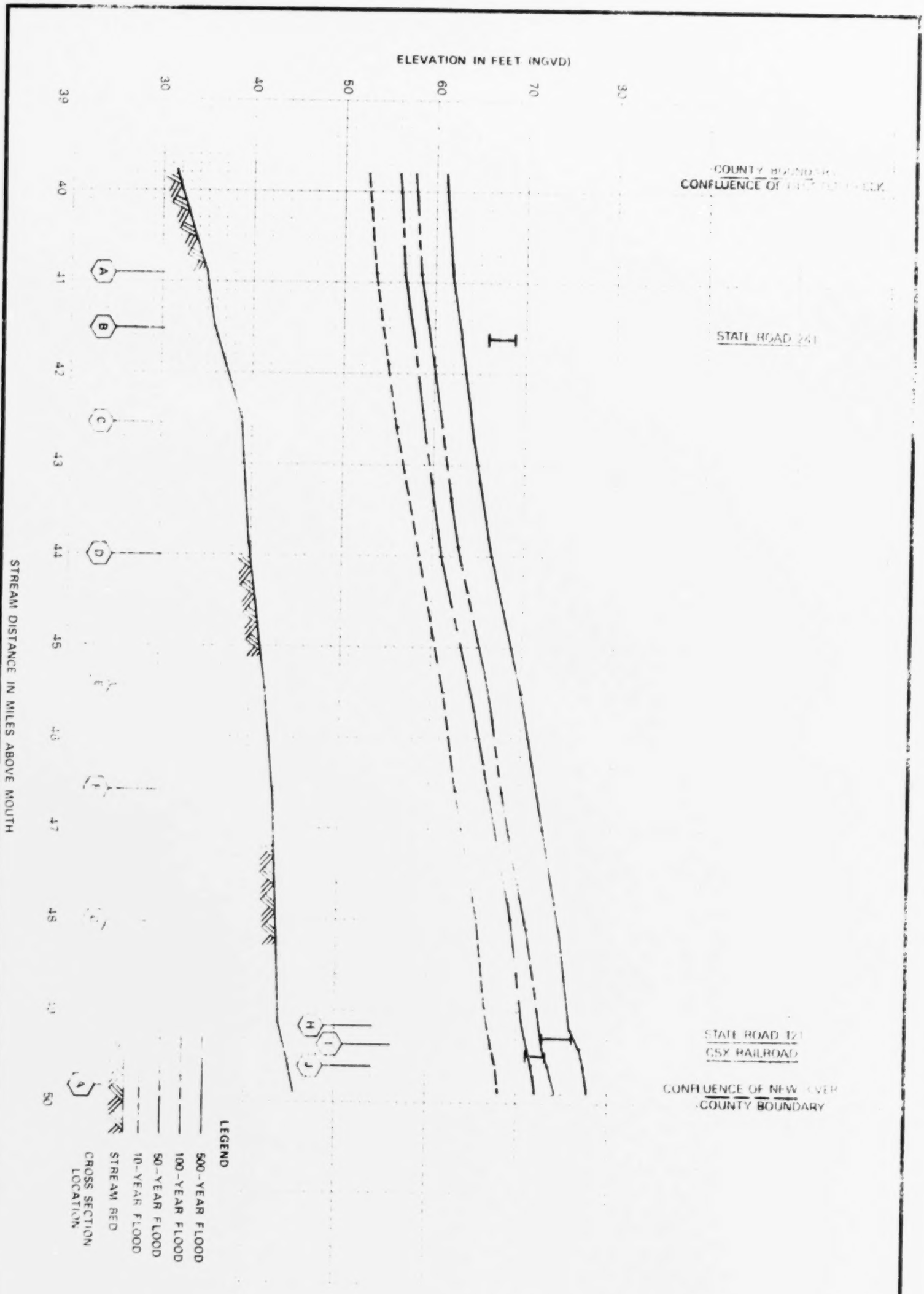
14. ————, Flood Insurance Study, Town of Worthington Springs, Union County, Florida, in progress.

15. ————, Flood Insurance Rate Map, Town of Lake Butler, Union County, Florida, July 1986.

16. U.S. Army Corps of Engineers, Jacksonville District, Survey Review, Suwannee River Basin, Georgia and Florida, in progress.

ELEVATION REFERENCE MARKS

REFERENCE MARK	FLOOD INSURANCE RATE MAP PANEL	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
1	0185	67.81	U.S. Geological Survey disk stamped "TT203TWC" set on southwest abutment of State Road 241 bridge over the Santa Fe River
2	0205	77.04	standard Corps of Engineers disk set flush in concrete post located at northwest corner of intersection of State Road 18 and road leading north to Fort Call Cemetery, 48 feet northeast of centerline of State Road 18, about 2.5 feet east of fence corner post
3	0205	131.11	standard Corps of Engineers disk set flush in concrete post located on south side of intersection of State Road 18 and State Road 239, on extension of centerline of State Road 239, about 45 feet from centerline of State Road 18
4	0205	121.31	standard Corps of Engineers disk stamped "SAF-6" set flush in concrete post located on southeast side of intersection of Gould driveway and east-west road about 3,500 feet southeast of intersection of State Road 18 and State Road 238 Alternate, about 2.5 feet northeast of fence post corner
5	0220	74.19	Florida Department of Transportation disk set on northeast side of State Road 121 bridge over the Santa Fe River



01P	FEDERAL EMERGENCY MANAGEMENT AGENCY **UNION COUNTY, FL** (UNINCORPORATED AREAS)	**FLOOD PROFILES** **SANTA FE RIVER**